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Lessons learned about design, monitoring and evaluation process definition and information management for international development programmes

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This paper discusses a multi-year project that analysed the World Vision International (WVI) Learning through Evaluation with Accountability and Planning (LEAP) transformational programme design, monitoring and evaluation (DME) model and developed LEAP Manager's WorkBench, a prototype web-based automated environment for LEAP. The LEAP framework is WVI's approach to programme-wide design, monitoring and evaluation. The primary purpose of this paper is to illustrate lessons learned about DME method definition and automation based on the prototype implementation. The paper begins by reviewing related work on DME models, definitions and automation. The paper identifies development issues to be examined in defining and automating DME models. The WVI LEAP model is briefly described and the knowledge management and organisational learning aspects of the LEAP framework are highlighted. Key principles used in developing an automated environment for LEAP are highlighted along with a brief overview of the LEAP Manager's WorkBench. The paper then critically examines the approach taken to define and automate LEAP and highlights the successes and limitations of the approach. The paper discusses the implications of this work on development practitioners, policymakers and researchers responsible for defining or automating DME models.

Introduction

Effective design, monitoring and evaluation (DME) of programmes has become a major focus for non-profit organisations (NPO). Donors and granting institutions are driving an emphasis on outcome-based impact evaluation. Communities are also demanding improvement in outcomes which, in complex contexts, requires sustained organisational learning. Today's information economy calls for real-time, web-based information systems that efficiently and effectively manage vast amounts of data produced by programme management processes. These systems must also contribute to standardising and professionalising programme management in the non-profit environment.

This paper reviews the theory and definition behind DME models within the international development space. It identifies issues to be examined in defining frameworks and developing information systems to support DME processes. A description of World Vision's Learning through Evaluation with Accountability and Planning (LEAP) model and development of an information system 'proof of concept', a collaboration with Messiah College, PA, highlights important knowledge management and organisational learning principles to be considered. The paper concludes by discussing broader

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implications for defining and developing information management systems to support the DME of international development programmes.

DME models and information systems

Background to programme design, monitoring and evaluation

Critiques of international development programmes highlight the need for systematic design and evaluation to promote learning and accountability (Cassen 1997, Smillie 1995, Gilmore 1998, Dichter 2003, Stiglitz 2003). Roche (1999) describes how competition between organisations, increased pressure to demonstrate tangible results, poor accountability and learning, increased needs for fundraising and advocacy, can combine with lack of professional norms and standards in the industry, to become self-reinforcing.

The issues that Roche describes however, also provide fertile ground for innovation and improvement. Cracknell (2000) notes how the strengthening of democratic institutions, the decline of authoritative regimes, reducing resources for aid, the growing complexity of development problems and trends towards privatisation, produce a climate which encourages development evaluation.

Building on roots extending back centuries, the professional practice of evaluation developed last century after the World Wars, mostly in relation to social programmes, particularly the evaluation of education, public health, resource allocation and poverty alleviation (Rossi *et al.* 2004). Evaluation practice in the international development sector has continued to evolve and organisations are increasing investment in the design, monitoring and evaluation of programmes.

Established principles for sustainable development are fostering professionalism of programme management, through the development of standards and norms for organisational behaviour (American Evaluation Association (AEA) 2004, Rugh 2004, World Vision 2007). These principles address issues such as the participation and welfare of stakeholders, the integrity and behaviour of staff, and the use of systematic inquiry. Myers (1999) comments that today's development context also places learning as an important programme management principle and motivator.

By using evaluation, organisations are able to manage the relationships of stakeholders to a programme and, to some degree, the relationships between stakeholder groups, as well as manage each stakeholder group's understanding of success with respect to their stake in a programme (Gosling [1995] 2003). Figure 1 presents the variation between five major stakeholder groups, their need for and focus on information.

There has traditionally been a bias towards accountability to donors as the main reason for evaluation. However the nexus between learning and accountability is re-balancing, therefore business processes and management systems are developing so as to manage this multiplicity of information needs. A stakeholder perspective provides a basic framework for organising information.

Diversity in actual practice exists, because of field experience (Estrella *et al.* 2000) and different organisational strategies. This diversity can trend towards confusion and differing interpretation of programme management. However discussions of shared understanding create collaborative opportunities to clarify concepts and standardise approaches. This has been achieved in the humanitarian disaster management sector (Emergency Capacity Building Project 2007), leading to emerging industry standards.

Stakeholder	Role	Need for information
Community or citizens	Those for whom change in their situation is the objective of planned activities	Understand the evolution of a programme in meeting their needs from service provision, to education and mobilization of rights through to policy change and implementation.
Professionals and subject matter experts	Implement activities	Learn how to improve the quality of their work, as exhibited through programme designs and implementation strategies.
Managers and administrators	Oversee implementation	Employ business process to drive efficiency and consistency of output delivery
Donors, supporters and policy makers	Influence or decide the course of action related to programmes	Understand the long-term strategic outcomes of programmes, as they seek to wisely invest resources.
Critics and other persons	Influence the programme environment	Meta-evaluation of the development space.

Figure 1. A stakeholders' perspective on information.

Programme management frameworks, originally informed by the major donors since the 1960's (Cracknell 2000), are increasingly outcome or impact focused. Table 1 summarises four high-level conceptual components that most organisational programme management frameworks have in common (Gosling [1995] 2003, Earl *et al.* 2001, World Vision 2007).

Logic models are used by most organisations to present cause and effect theories of change. These models become the base for monitoring implementation and subsequent evaluation (Mercy Corps 2003, World Vision 2007). Table 2 illustrates a typical definition of the structure and content of a logframe (AusAid 2005).

Organisations are proficient at monitoring outputs. However, the demonstration of impact, defined in this context as the efficient and consistent delivery of outputs and the effectiveness of outcomes, has been inconsistent. Donors are increasingly demanding demonstration of impact. Traditionally, this involved experimental approaches, which were independent and technical, remaining foreign to clients and non-participatory.

However, as the rationale for evaluation embraces goal-oriented, decision making and user-oriented approaches, innovative methods emerge which encourage collaboration and participation, reducing the overall investment of resources while satisfying the information needs of different stakeholders.

Outcome mapping (Earl *et al.* 2001) is a participatory approach which places behaviour change at the heart of the development paradigm and focuses on measuring the changes in partners' behaviour as a contribution to development impact. Most Significant Change (Davies and Dart 2005) is a participatory method which involves programme partners in regular discussion and analysis of the major changes observed and experienced, due to a programme's activities and outputs. The value of change is judged by programme participants, ensuring a focus on impact and not on outputs. Both of these methods are indicative

Table 1. Common components of the programme management cycle.

Component	Definition	Purpose
Assessment (or formative evaluation)	Process of defining the 'why' of a proposed programme or project	• Understand the current situation in context • Identify and understand development issues in the local area and who is tackling these at present • Identify opportunities, vulnerabilities, capacities and resources • Understand how to best support efforts already being made to tackle poverty • Decide upon feasibility and set priorities
Design	The process of planning appropriate programme and project strategies using assessment results, to show how issues identified can be addressed Community needs, rights, and priorities are all taken into account in deciding whether to implement a programme or project	• Develop a logical and strategic plan to address issues • Prioritise issues and opportunities, and further investigate details, to develop clear objectives • Ensure partners are clear about roles and responsibilities, so the programme or project can be effectively managed • Understand what will be undertaken in the short- and longer-term to effect desired change • Identify ways to measure progress, in relation to objectives • Consider and reflect on alternative strategies that could be taken to address issues, and compare relative pros and cons • Provide the key document that, once agreed upon by partners, forms the basis for funding, implementation, monitoring, reporting, evaluation, reflection and transition
Monitoring	The routine collection of information to establish the efficiency of implementation Monitoring supports basic management and accountability, and tracks actual performance against the original design. Monitoring involves recommending appropriate project management responses, to guide implementation	• Assist implementation by identifying successes and challenges, thereby informing decisions about necessary project changes • Provide understanding regarding changes in context that require changes in design • Provide information on progress towards short-term results, for accountability and lobbying, evaluation and learning • Encourage and celebrate partners' achievements in tackling poverty and injustice
Evaluation (both normative and summative)	A time-bound exercise that attempts to systematically and objectively assess relevance, performance and success, or lack thereof, of ongoing and completed programmes and projects.	• Provide information on what worked, what did not work, and why • Determine whether underlying programme and project theories and assumptions were valid • Determine efficiency, consistency, effectiveness, relevance and sustainability of projects and programmes • Guide decision makers or programmers in reproducing programmes that succeed • Encourage and celebrate partners' achievements • Document new knowledge and important topics for further inquiry, lobbying and influence • Promote accountability and learning

Table 2. General structure and content of a logical framework.

Activity description	Indicators	Means of verification	Assumptions
Goal or impact – the long term development impact (policy goal) that the activity contributes at a national or sectoral level	How the achievement will be measured – including appropriate targets (quantity, quality and time)	Sources of information on the goal indicator(s) – including who will collect it and how often	
Purpose or outcome – the medium term results that the activity aims to achieve – in terms of benefits to target groups	How the achievement of the purpose will be measured – including appropriate targets (quantity, quality and time)	Sources of information on the purpose indicator(s) – including who will collect it and how often	Assumptions concerning the purpose to goal linkage
Component objectives or intermediate results – this level in the objectives or results hierarchy can be used to provide a clear link between outputs and outcomes (particularly for larger multi-component activities)	How the achievement of the component objectives will be measured – including appropriate targets (quantity, quality and time)	Sources of information on the component objectives indicator(s) – including who will collect it and how often	Assumptions concerning the component objectives to purpose linkage
Outputs – the tangible products or services that the activity will deliver	How the achievement of the outputs will be measured – including appropriate targets (quantity, quality and time)	Sources of information on the output indicator(s) – including who will collect it and how often	Assumptions concerning the outputs to component objectives linkage

of innovative methods which aim to meet the expectations of different programme stakeholders regarding impact evaluation.

The need for programme information systems

Today's development context consists of globally distributed organisations, who increasingly share common objectives (United Nations 2008). While organisations' business processes vary however, common information products, e.g. evaluations, design and plans, reports, budgets, stories of change, present an opportunity for collaboration and potential development of industry standards. The stakeholder perspective, introduced above, provides an appropriate process framework for analysing and integrating the use and governance of various programme information.

Lessons of successful innovation and integration of distributed businesses from corporate industry demand comprehensive information technology strategy and infrastructure in order to support and manage programme information efficiently and collaboratively. Business processes and systems must develop around modular components which can be modified, combined and re-used in multiple ways (Cash *et al.* 2008).

It is unlikely that the resources for developing such systems lie within NPOs and so they must rely on external experts, consultants and academia, where talent, costs and motivation to innovate are concentrated in specific areas of expertise.

Key principles for developing DME information systems

Stakeholder roles, their information needs and their relationships to each other as partners in a programme (Figure 1) provide rationale for pursuing different information system strategies. Programme staff, technical subject matter experts and community members are the producers of programme information. Managers, administrators, donors and policy makers are consumers of programme information for purposes, other than direct programme management.

This is a subtle difference which informs the underlying philosophy of a system. A simple example is illustrative. On the one hand a system could facilitate the creation of a programme artifact (e.g. a design document) using database technology, templates and report generation technology, after staff complete the process *in situ*. On the other hand you could have a system that guides staff through the actual design process itself, step-by-step, as defined in organisational DME process guides (World Vision 2007). This might include a graphics tools for mapping out regional demographics, capturing rich media representation of programme theory (e.g. images from a workshop), tools that automate research of secondary data sites, a logical framework builder, budget development tools, etc. Eventually, a complete design document might be produced by the system based on the inputs during each step of the process. The first system is management of programme information, whereas the second system is programme management itself.

The two are not mutually exclusive and most organisations identify the need for both, however make decisions on where to start. The decision is guided by different criteria for sequencing and pacing a solution. Some of the key criteria to consider are:

(1) *Economic*. Information systems dramatically improve the efficiency (i.e. reduce the time taken and cost of performing DME) and effectiveness (i.e. the improvement to programme management) of DME processes.
(2) *Management*. Timely, accurate and accessible information fine tunes the programme management life cycle.
(3) *Compliance*. Development organisations must meet obligations with certain donors. Legal and contractual compliance is supported through the timely delivery of necessary information.
(4) *Donor-facing versus community-facing*. Many development organisations see donors as the primary beneficiary of a system in terms of data collection and reporting. Other development organisations see the communities they are serving as the primary beneficiary of a system. While these perspectives are not mutually exclusive, they do tend to influence how you think about the system.
(5) *Globalisation*. Web-based information systems facilitate the need for real-time global availability of information.
(6) *Standardisation*. There is urgent need to standardise and encourage promising DME practices and processes, while critically reflecting on poor practice. Development organisations are increasingly being challenged to do more with fewer resources. Information systems can provide some level of process improvement, standardisation and workflow.
(7) *Ease of use*. An information system must be easy to use by a diverse population of system users ranging from development staff to community volunteers. This creates unique challenges including computer literacy, the need for multi-lingual systems, and designing systems for first-time computer users.

(8) *Appropriate technology*. Care must be taken to ensure that appropriate technology is being used in the information system initiative. Considerations include Internet access, level of internal IT competence, environmental factors and computing facilities.

Survey of DME related systems

Information systems in the DME arena can be classified into three types. There are *in-house systems*, designed, funded and developed internally. There are *commercial systems,* created, funded, sold and supported by independent commercial software companies. Finally, there are *open source-based systems,* built on the open source community model and made available for free in the public domain.

In-house systems have been developed by numerous organisations. Most of these systems are built on top of a database management system and include basic support for programme data capture, reporting and web portals. These systems are not well documented in the literature and are difficult to learn about for people external to the organisation in which they were developed. Examples of these systems include the LEAP Manager's WorkBench discussed in this paper, CHF International's web-based project reporting system (CHF 2009) and Npoki's performance management systems (NPOKI 2009).

There are several commercial systems available. Voxiva's Program Manager (Voxiva 2009) offers a solution for management of development programs, including managing, monitoring and evaluation. Dunia Soko's product, GYST™ (Gyst 2009) also offers a DME solution and includes support for grant and financial management. Newdea (Newdea 2009) offers a web-based solution for donors, nonprofits and foundations. The primary focus of NewDea's product is measuring the impact of development programs and associated donor reporting. Blackbaud (Blackbaud 2009) offers a product that is donor-focused with support for fund-raising and financial management.

Finally, a number of open source-based systems exist that are relevant to development in general. These systems can often be found by searching www.sourceforge.net, the leading portal for locating open source software. An example of an open source application for the development community is CiviCRM (CiviCRM 2009), a constituent relationship management solution for the civic sector. Despite the fact that the open source model is a natural fit for developing DME software to aid NPOs, no open source DME applications exist that are in prevalent use.

Information systems to support the DME process are still in their infancy. These first generation systems tend to focus on a single stakeholder group and are primarily driven by the needs of the donor population. These systems do not support the whole DME life cycle but instead tend to focus on a phase of the DME life cycle. These systems are maturing and future systems will include support for various stakeholders and perspectives across the full DME life cycle. As these systems evolve, we expect such systems to have a demonstrable impact on field outcomes.

Overview of LEAP, World Vision's DME framework

World Vision commenced the research and design of common standards for programme design, monitoring and performance measurement in 2002. An extensive literature review was conducted, which was followed by worldwide consultations throughout 2003 and 2004, to review early drafts. LEAP (World Vision 2007) was published in October 2004 and is gradually being introduced across all programmes, worldwide.

LEAP stands for learning through evaluation with accountability and planning. Table 3 and Figure 2 define the major elements of the framework.

Six components of programme cycle management are defined in LEAP:

(1) Assessment,
(2) Design,
(3) Monitoring,
(4) Evaluation,
(5) Reflection, and
(6) Transition.

The framework defines the roles and responsibilities of different partners in programming processes. LEAP is focused at the programme and project level, not speaking directly to strategy development at higher levels of the organisation, but describing how

Table 3. Definition of LEAP.

Learning	Change in thinking and action through reflection on sound information about present and past experience
Evaluation	Systematically and objectively assessing the relevance, performance and success, or lack thereof, of ongoing and completed programmes and projects. This is done by comparing available data, monitoring implementation and conducting planned periodic evaluations
Accountability	Demonstrating responsibility to provide evidence to all partners that a programme or project has been carried out according to the agreed design
Planning	Identifying and scheduling adequate resources for activities that logically lead to outputs, outcomes and goals; working with management to link programme and project plans to national and regional strategies

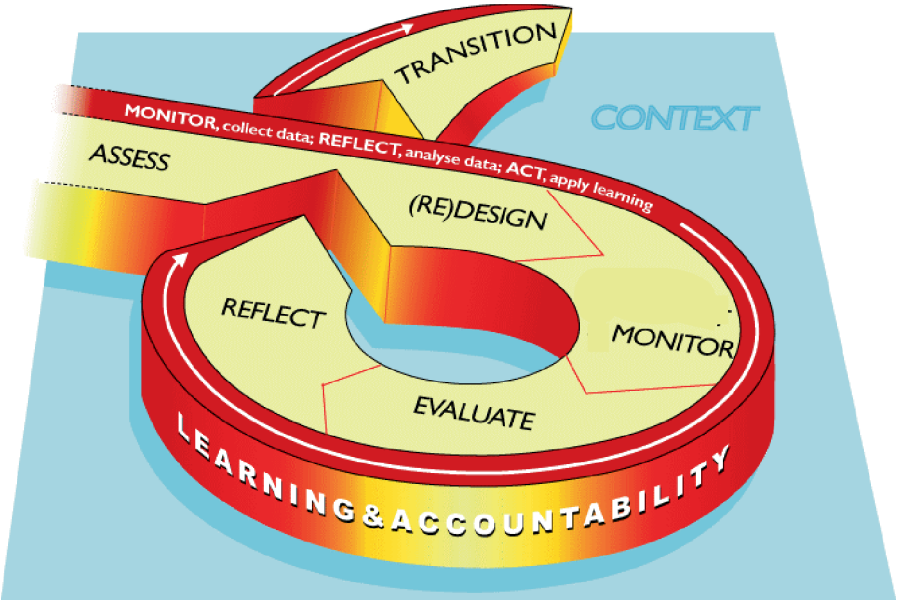

Figure 2. Learning through evaluation with accountability and planning (LEAP) programme management cycle.

programmes must be linked with strategy. The framework mandates key programming products and provides a tool kit consisting of templates, review guidelines and checklists for those products. The framework seeks to realise a vision for common approaches to programming that promote learning on an organisational level, while building programming quality, accountability and professionalism. Since January 2005, the system has been introduced in just under 75% of development programmes, with approximately 25% of programmes now using the standardised reporting tools (World Vision 2009a).

Overview of LEAP Manager's WorkBench

This section of the paper introduces the LEAP Manager's WorkBench. It discusses the goals of the LEAP Manager's WorkBench and provides a brief functional overview of the system. It briefly discusses the pilot phase of the project.

Introduction to LEAP Manager's WorkBench

The *LEAP Manager's WorkBench (LMW)* is a cooperative project between Messiah College and World Vision that began in 2005. The project is a proof of concept prototype of a field-facing web-based automated support environment for the LEAP life cycle depicted in Figure 2. The primary target users of the system are field staff. The development of the LMW has been done in the context of a database application course over a several year period. The course employs a service-learning educational pedagogy (Nejmeh 2008). The objectives for the LMW are depicted in Figure 3.

Per Figure 3, the strategic mandates are global World Vision mandates that span the organisation. Certainly LEAP, and any effort related to LEAP, must be aligned and contribute to fulfilling the mandates and the ultimate World Vision goal of being a learning organisation whose programess achieve improved child well being. Figure 3 delineates the direct outcomes to which LMW contributes as well as broader World Vision directives to which LMW contributes.

Functional overview of LEAP Manager's WorkBench

The LEAP Manager's WorkBench is a secure, web-based portal application that provides support for various phases of the LEAP life cycle as depicted in Figure 2.

The key functional aspects of LMW follow:

- *Web Interface*. The entire application appears via a web interface and includes a tree structure for navigating, adding, browsing and updating LEAP artifacts.
- *User Management*. This component allows for the creation and administration of users and security settings.
- *Programme Definition*. The definition of broad programme metadata, e.g. the name of the region, its geographic boundaries and contact information within the region.
- *Design*. This component allows for the design of specific projects. It includes a hierarchical definition of project objectives, assumptions and risks, based on a logical framework model. It also allows for indicators to be defined that are subsequently used to monitor project progress. The system produces a provisional design document.
- *Budgeting*. This component of the system allows for project activity-level budgets to be created and edited.

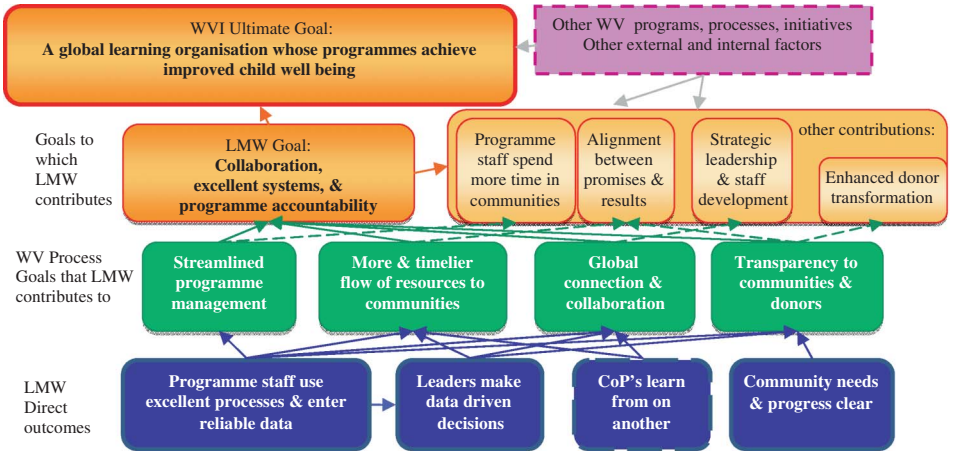

Figure 3. Learning through evaluation with accountability and planning (LEAP) and LEAP Manager's WorkBench in context.

- *Implement and Monitor*. This component supports the collection and analysis of indicator data during the implementation of a project based on the indicators defined during the design phase.
- *Reporting*. The system automatically produces logframe reports and indicator tracking tables based on data provided during design and implementation.

Pilot phase of LEAP Manager's WorkBench

There has been significant interaction with World Vision programming throughout the development of LMW. During the early stages of the project, software engineers on the project spent ten weeks on location in Mali. This allowed project personnel to better understand how field staff implemented LEAP, what they expected from an information system and the environmental/technical constraints in which the system had to operate. In addition, World Vision staff from several locations, including Mali and the US, have used the LMW system and provided valuable feedback.

DME lessons learned from LEAP

This section of the paper discusses the implications of this work on development practitioners, policymakers and researchers responsible for defining and automating design, monitoring and evaluation models.

World Vision's approach to developing LEAP was to study existing frameworks, identify best practice and then build consensus among members of the partnership as to

how to combine that into one global framework. The successful implementation of the platform is predicated upon two key issues, among others. Firstly, there is the need to build programming competence, while actively managing the organisation's change to a new way of learning. Secondly, the existence of a global programme management information system, so that programmes can tactically capture, distil and share information, in real time. Evaluation of the initial three years of deployment of the system highlights several themes (World Vision 2008).

Complexity of development versus need for programme management simplicity

Critiques of programme management models, and in particular the use of the logical framework approach as a design tool, discuss the pitfalls of trying to apply simple cause and effect models to complex development programming environments (Cracknell 2000, Earl *et al.* 2001).

Implementation of LEAP in World Vision does result in improved strategic alignment and focus of programmes, better participation of partners, and improved sharing of information, because of common processes, languages and toolsets. However, despite the complexity of development issues, field practitioners articulate the need for simplicity, including practical guidelines on priority issues and models for how projects integrate into a holistic development programme. They also cite the need for access to local language versions of resources and simple toolsets that can be adapted to local contexts. There remains a tension between the assessment of complex development issues and appropriate programme design, with the need for easily applied systems and tools of practice.

Role of organisational change management

The workload for programming staff has increased, due to the formalisation of design, monitoring, reporting and review processes. This includes an increased demand for technical subject matter expertise. The vision and will of senior management to allocate time and resources is necessary to promote and mainstream successful professional networking and adoption of the system. A management policy of standards by which programmes can be audited for alignment can be incentive for uptake.

The growth in the industry in the past decade means that there are large numbers of new staff and staff attrition is high. This impacts the introduction of a new programming system, which is progressing at about half the speed initially planned. Ongoing education and training, at all levels of organisational structure, reinforce programming standards and competency development. However, capacity-building approaches must be tailored to specific contexts and contemporary content, using a full range of flexible and blended learning strategies. This adds a level of complexity to the training environment. Competency assessment is recommended, along with coaching and mentoring strategies.

Understanding power relations in the organisation was important while developing LEAP, so that the power constructs between programme stakeholders were re-balanced, reinforcing partnership and twin-citizenship constructs. This resulted in a framework which the entire global organisation could endorse. With new opportunities for learning, field staff stress the importance of capacity building events which emphasise mutual learning from field experience, balanced with theory from experts. Evaluation shows that collaboration with external (to the programme) experts is valued early on in the programme management cycle and thereafter. All this should be facilitated within the construct of minimum standards for participation.

Tactical knowledge management

Simply stated, strategic knowledge management is promoted with a system that manages artefacts, skill sets, programme heuristics, relationships, experience and natural talent (Snowden 2000). The implementation of a global programme management system has highlighted several tactical knowledge management issues.

Information is valuable at the local level and therefore manual, even paper-based systems are appropriate for local contexts. However today's complex and rapidly changing collaborative environments demand real time access to information that can inform results-based management and improve reproduce-ability of successful programme models. Ideally, partners can be connected across the 'end-to-end' process, from managing donor relationships, to field implementation, monitoring and reporting for accountability, to knowledge capture for action learning.

Implications for defining new DME models

Articulation of business processes and the roles, responsibilities and relationships of partners positively impacts the design and uptake of DME frameworks. Proactive process improvement and mapping can provide basis for requirements engineering for information systems and accompanying data models.

The complexity of the development environment needs to be managed with simple and effective tools that promote collaboration of partners and opportunities for action learning. Participation means development of DME competencies; however this is a doubled-edged sword in today's competitive development environments, where qualified DME staff are sought after and effective capacity building can result in staff attrition. Long-term capacity building strategies for competency development are needed. At the same time, organisations are encouraged to develop strategies for retention of trained and competent staff.

As data and information repositories grow and knowledge is shared, the governance of information becomes tantamount. Few NPOs have researched information governance and instituted policy for internal or public disclosure of information. Organisational maturity informs the pacing and sequencing of data governance implementation.

Data governance calls for strong leadership and sponsorship by organisational executives. Senior partners who can represent their business' stake in information should form a data governance organisation, responsible to establish policy around data governance and stewardship roles, principle-based decisions, as well as a framework of concepts, terms and components for data governance, a model for rule-making and decision rights, champion and develop data governance across businesses, and align with other cross-functional efforts (World Vision 2009b). It is important to demonstrate value to the organisation by addressing data governance issues for data that currently has high priority for the organisation.

Lessons learned about DME automation

Introduction

This section of the paper critically examines the approach taken to automate LEAP and highlights the successes and limitations of the approach. A key question this section of the paper addresses is 'How well does a DME framework (such as LEAP) that was originally conceived as a field guide for development staff, act to guide the development of

web-based software support environment?' We also summarise the lessons learned about the DME model itself, learned through the development of an automated support environment for LEAP. We divide the lessons learned into model definition lessons, organisational lessons and technical lessons.

Model definition lessons learned

The basis for LMW were the LEAP core documents (World Vision 2007). These documents define the LEAP life cycle in terms of phases and outputs. LEAP was written to guide field managers in planning, conceiving, defining, designing, implementing, monitoring and refining field programmes and projects. The documents were not written with a view towards the development of an automated system, but rather as a standard and guidelines to field development staff. A key lesson learned is that one should not rely on DME definition documents as the primary source for information systems requirements engineering. Instead, DME documents need to be significantly supplemented with other requirements, engineering techniques, including stakeholder interviews, observation, focus groups and broader document analysis.

We discovered a number of ambiguities in the definition of LEAP that only became clear as a consequence of our effort to provide automation support for LEAP. This is a common phenomenon with idealised process definitions. In some cases, our work uncovered ambiguity existing in the LEAP definition that had nothing to do with implementing a system. In other cases, it was implementation considerations that required clarification. A summary of these key lessons learned follows.

- *Graphical representation of DME plan*. Given that we implemented an automated support environment for LEAP, we needed some guidance on a logical way to graphically represent the hierarchy implied by LEAP for purposes of rendering and navigating the model in the software. We developed a Tree Editor much like the Windows paradigm for navigating the file system.
- *User groups and roles*. Given that we implemented an information system, we needed specific definitions of user groups, roles, responsibilities and access controls for reading, editing and writing data stored in the system needed to be clearly defined. We decided to implement a hierarchical security model based on the user groups implied by the stakeholders identified in Figure 1 to control read and write access to LEAP data.
- *Reporting*. The LEAP documentation outlined some reporting requirements, but they were far from definitive. We settled on a simple logframe and indicator tracking table as the standard reports. In addition, the system provides a great deal of flexibility for standard and ad-hoc reporting through a report-writing tool.
- *Relationships between DME elements*. Many DME constructs were defined in the LEAP documentation. However, the precise relationships between problem statements, objectives, alternative designs, programs, projects and risks were unclear. LEAP is not definitive on the nature of the relationships between these DME constructs. This is due to the widely varying contexts in which LEAP is used and the complexity of such environments. Therefore, rather than consider missing relationships between DME constructs as errors, LMW simply identifies missing relationships between DME constructs as warnings to be verified by DME staff.
- *Indicator value types*. The specific indicator value types to be supported by the system to track the progress of activities needed to be more precisely defined. In the

end, we supported the following indicator types: integer, percentage, Boolean and text. Text was used as a qualitative narrative indicator value type.

- *Indicator input collection frequency*. The LEAP documents were not specific about the frequency with which indicator data should be collected during implementation. We decided to make this a configurable property of an indicator type with the number of times per year an indicator should be collected during implementation.
- *Indicator output reporting*. The LEAP documents were not specific about the frequency with which indicator data should be reported during implementation. We decided to make this a configurable property of an indicator type that had to be consistent with the input collection frequency.
- *Budgeting*. An issue is the level at which budgeting should be done during design. We decided to budget at the activity-level for each project and to then aggregate a project-level budget as a roll-up of the activities in the project. We also thought that it was best to produce an initial budget in the application and then to export the budget into the project accounting system used by World Vision.

Organisational lessons learned

Care must be taken to understand that providing an information system is just one tool among many needed for success. The World Vision experience to date strongly suggests that managing organisational change is a critical non-technical element of facilitating the change of an organisation to an information-enhanced infrastructure. Huysman and de Wit (2004) also notes organisations risk becoming too dependent on information systems and overlook the value of personal relationships for knowledge sharing. Huysman also warns organisations to properly adapt the systems to field personnel who will be working with them. There is an inherent tension between the adaptation of programming models and the need to enforce rigorous programming standards. The LMW approach of identifying deviations from LEAP standards and guidelines as simple warnings to be verified by DME staff rather than errors was our approach to managing this tension. The experience at World Vision serves to reinforce Huysman's findings and to encourage others to see information systems as a necessary, but not sufficient, condition for success in DME.

We also learned that different user groups have different data, workflow, report and automated support needs. Care should be taken to carefully consider workers at various levels in the organisation, beginning with field facing personnel. If too much emphasis is placed on reporting data to the national offices and global support offices, and field worker information needs are not met, the outcome-based impacts of the system, particularly on learning, will be diminished.

Another critical lesson we learned mirrors that of industry. Just as it is the case with business processes, some level of process maturity is needed before it can be supported (Hammer and Champy 1993). Process maturity should be an influence on the order in which you implement information system support. As processes mature, information systems can transition from supporting such processes to automating such processes. The purpose of LMW is not necessarily to automate the LEAP process, but instead to automate the capture of the outputs of following the LEAP process. Process automation is a much more difficult goal to attain. In essence, the output of the LMW design tool is a provisional design document from data given, including stakeholder analysis, strategy identification and risk assessment. Said another way, LMW is not about helping field practitioners theorise in a better way, it is about capturing the theory.

Longitudinal data collection and reporting is a useful tool for determining the impact of programmes in a region. At the same time, care must be taken when doing comparative data analysis across programmes. Given the lack of controlled environments, and the complex confounding present, it is difficult to draw conclusions.

The creation of an information system in support of a DME method needs someone to act as an overall design authority to resolve issues of method interpretation and clarification. When issues such as the ones discussed above are identified, they need to be resolved in a rationale and timely manner.

The holy grail of information systems for DME methods is to strike the proper balance in serving the needs of both donors and field-facing personnel. This is a difficult, but necessary balance to achieve as both perspectives for learning and accountability are important to account for if the system is to be successful.

Technical lessons learned

We highlight several of the technical lessons learned from our project. The use of a data modelling notation such as ER data models (Teorey 1999) proved to be very valuable to the project. Data models proved to be a very reliable and useful notation to facilitate communication between development staff and technical staff building the system. The data model approach also forced a level of rigor on the definition of the DME model that proved to be insightful. It allowed for some of the ambiguities and issues discussed above to be revealed and resolved.

Secondly, we realised early on that any web-based system would need to be supported by an off-line capability. This would deal with the reality that we still live in a somewhat disconnected world (Digital Divide 2009) while at the same time allowing for data to be collected and synchronised when a connection to the web becomes available.

Thirdly, social media technologies focused on user-generated content offer significant opportunities to transform the DME process. Social media technologies include wiki platforms (Twiki 2009), blogging platforms (WordPress 2009), citizen journalism platforms (Helium 2009), video-sharing platforms (YouTube 2009), mash-up technologies (MashMaker 2009), social networking platforms (Facebook 2009) and current status platforms (Twitter 2009). In short, these technologies facilitate collaboration and cooperation among a diverse group of people. Development organisations have a keen interest in exploiting social media technologies to capture project discovery, action, results and feedback as part of the DME process. A key issue to be addressed is how social media technologies can best be used by development organisations, their partners and the communities they serve to aid in the development process.

Finally, we have come to appreciate the significance of mobile applications running on the GSM and GPRS networks in the developing world. No information system supporting development is complete without some level of mobile application support. Similarly, GPS-based services, integrated with technologies such as Google maps offer huge promise for the future.

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